

# PATENT SPECIFICATION



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## PROVISIONAL SPECIFICATION.

### Improvements in or relating to Respirators, Gas-masks and other like Apparatus.

I, JOHN AMBROSE SADD, British subject, of Experimental Station, Porton, in the County of Wilts, do hereby declare the nature of this invention to be as follows:—

This invention relates to respirators, gas-masks, and other like apparatus, with particular reference to the face-pieces or mouth pieces of such devices, the object of the invention being to devise improvements in the construction and arrangement of such face-pieces which will render them more certain and effective in operation than those hitherto adopted.

The invention consists in a face-piece for respirators and the like in which the expiratory valve is disposed centrally within the tube of the face-piece thus protecting the valve from damage and rendering also possible the use of a trumpet-shaped or flared tube having the effect of increasing loudness of speech.

The invention also consists in a face-piece for a respirator or the like comprising a sound collecting mouth piece or trumpet disposed within the mask, whereby the air expelled from the lungs in the act of speech passes direct through the expiratory valve to the outer air, thus giving maximum loudness of speech.

The invention also consists in the provision in a mask or the like provided with means whereby the inspired air may be caused to pass over the eye-pieces for the purpose of preventing condensation of moisture thereon, of means whereby the inspired air may be taken direct to the lungs of the wearer, thus rendering the protection of the lungs independent of leakage from the surrounding atmosphere into the internal air space of the mask.

The invention also consists in the application to masks or breathing devices of expansion cavities or channels for sealing any cavity containing the eyes, nose, mouth, etc. (into which it is desirable that no leakage should occur) by surrounding the leakage path with purified air.

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The invention also comprises other details and arrangements hereinafter described or indicated.

In carrying my invention into effect in one convenient manner, I form the respirator, mask or other like apparatus, with an angle tube of metal or other suitable material, secured in a gas-tight manner by means of washers, packing, or any other suitable manner to the material of the gas-mask, the angle tube comprising a portion projecting substantially at right angles to the mask for the passage of expired air, and a lateral or other connection for the inspired air from the purifying canister or other like device, with which the mask is associated.

The expiratory valve, which may be of the rubber tube or any other desired variety, is disposed centrally within the projecting tube through which the expired air passes with the result that such tube affords complete protection for the expiratory valve against damage or destruction, while at the same time the tube may be trumpet-shaped or provided with a flared end whereby it results that the air expired in the act of speech by the wearer will be ejected in a manner most advantageous from the point of view of the desired loudness of speech.

The valve may be arranged upon a corrugated nipple within the tube or may be mounted in any other desired manner, and within the mask and in line with the expiratory valve, I may provide a trumpet-shaped collecting mouth piece so that on approaching the lips of the wearer to such mouth piece all the air expired from the lungs in the act of speech will be caused to issue through the expiratory valve and thence through the delivery tube, thus giving a maximum loudness of speech.

When applying my invention to a mask having an angle tube or like fitting provided with means whereby the inspired air may be caused to pass over the eye-

pieces for the purpose of preventing condensation of moisture thereon, I provide means whereby the inspired air may be taken direct to the lungs of the wearer and communication with the inside of the mask is cut off so that complete protection will be given to the lungs of the wearer independent of leakage from the surrounding atmosphere into the internal air space of the mask.

In one method of attaining this object I provide a spring-controlled valve of suitable form in conjunction with the passage leading from the angle tube to the eye-pieces of the mask, and such valve is adapted to be actuated by a lever arranged in the mouth piece within the mask or adapted to project into the space within the mask so that such lever may be actuated by the teeth of the wearer or otherwise with the object of lifting or otherwise moving the valve against its weight or against its controlling spring and maintaining it in such position wherein the passage to the eye-pieces is completely closed and communication established between the canister or other source of inspired air and the lungs of the wearer.

When a non-return valve, such as above described, is employed for controlling the flow of air into or out of the system I may combine therewith a diaphragm suitably apertured and so constructed and arranged that the pressure causing opening and closing of the valve is not limited to the

product of the intensity of the pressure in the cavity multiplied by the area of the valve opening but may be made several times greater (depending upon the relation between the area of the diaphragm and the area of the aperture therein) thus giving a tight closure of the valve for relatively small pressure differences.

In any modification of the invention I may provide one or more channels or the like adjacent to any part at which leakage is likely to occur and through which channels the expired air (or through which purified air) may be passed, so that the joints in question will thereby be safeguarded against leakage of any deleterious gases, it being obvious that the channels or openings may be modified as to their number and arrangement and the means for circulating air therethrough or thereover as may be found to give the best results in practice, having regard to the character of the device to which the invention is to be applied and the conditions under which the same is to be employed.

It will be understood that the invention is not to be limited to the herein described details of construction and arrangement which are given by way of example only; and further, I may embody any one or more of such details in the one mask or face-piece depending upon any particular practical requirements that may have to be fulfilled.

Dated this 9th day of April, 1921.

MARKS & CLERK.

#### COMPLETE SPECIFICATION.

#### Improvements in or relating to Respirators, Gas Masks and other like Apparatus.

I, JOHN AMBROSE SADD, of Experimental Station, Porton, in the County of Wilts, a subject of the King of Great Britain and Ireland, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to respirators, gas-masks, and other like apparatus, with particular reference to the face-pieces or mouth pieces of such devices, the object of the invention being to devise improvements in the construction and arrangement of such face-pieces which will render them more certain and effective in operation than those hitherto adopted.

The invention consists in a face-piece for respirators and the like having an angle tube comprising a part projecting substantially at right angles to the mask

for the passage of expired air and containing the expiratory valve, and a lateral branch for the passage of the purified air, said lateral branch communicating with a passage concentric with the expiratory passage.

The invention also consists in a face-piece for a respirator or the like of the above character, comprising a sound-collecting mouth piece or trumpet disposed within the mask, whereby the air expelled from the lungs in the act of speech passes direct through the expiratory valve to the outer air, thus giving maximum loudness of speech.

The invention also consists in the provision in a mask or the like having means whereby the inspired air may be caused to pass over the eye-pieces for the purpose of preventing condensation of moisture thereon, of means whereby the inspired air

may be taken direct to the lungs of the wearer, thus rendering the protection of the lungs independent of leakage from the surrounding atmosphere into the internal air space of the mask.

5 The invention also consists in the application to masks or breathing devices of expansion cavities or channels for sealing any cavity containing the eyes, nose, 10 mouth, &c. (into which it is desirable that no leakage should occur) by surrounding the leakage path with non-toxic or expired air.

The invention also comprises other details and arrangements hereinafter 15 described or indicated.

The accompanying drawings illustrate two modes of carrying out the invention:—

20 Figure 1 is a rear elevation of one form of mask in accordance with the invention;

Figure 2 is a side sectional elevation;

Figure 3 is a part elevation;

25 Figure 4 is a plan of a valve shown in Figure 2;

Figure 5 is a front elevation of a second form of mask in accordance with the invention;

30 Figure 6 is a side sectional elevation;

Figure 7 is a rear view with a part removed, and

Figure 8 is a rear elevation.

35 Figure 9 shows a side elevation, partly in section, of a form of mask with means for preventing leakage, and

Figure 10 is a similar view of a further form of mask showing a modified arrangement for preventing leakage.

40 In carrying my invention into effect in one convenient manner as illustrated in Figures 1 to 4, I form the respirator, mask or other like apparatus with an angle tube of metal or other suitable material secured in a gas-tight manner 45 by means of washers, packing or any other suitable manner to the material *a* of the gas-mask, the angle tube comprising a portion *b* projecting substantially at right angles to the mask for the passage of expired air and a lateral or other connection 50 *c* for the inspired air from the purifying canister or other like device (not shown) with which the mask is associated, said lateral connection being in communication with a passage *c*<sup>1</sup> which is concentric with the nipple *e* hereinafter 55 referred to.

60 The expiratory valve *d*, which may be of the rubber tube or any other desired variety, is disposed centrally within the projecting tube *b* through which the expired air passes, with the result that such tube affords complete protection for 65 the expiratory valve against damage or

destruction, while at the same time the tube, although not so shown in Figure 2, may be trumpet-shaped or provided with a flared end whereby it results that the air expired in the act of speech by the wearer 70 will be ejected in a manner most advantageous from the point of view of the desired loudness of speech.

The valve may be arranged upon a corrugated nipple *e* within the tube or 75 may be mounted in any other desired manner, and within the mask and in line with the expiratory valve I may provide a trumpet-shaped collecting mouth piece *f* so that on approaching the lips of the 80 wearer to such mouth piece all the air expired from the lungs in the act of speech will be caused to issue through the expiratory valve and thence through the delivery tube, thus giving a maximum 85 loudness of speech.

When applying my invention to a mask having an angle tube or like fitting provided with means whereby the inspired air may be caused to pass over the eye-pieces 90 for the purpose of preventing condensation of moisture thereon, I provide means whereby the inspired air may be taken direct to the lungs of the wearer and communication with the inside of the mask 95 is cut off so that complete protection will be given to the lungs of the wearer independent of leakage from the surrounding atmosphere into the internal air space of the mask. 100

In one method of attaining this object, as shown in Figures 5 to 8, I provide a spring-controlled valve *g* of suitable form in conjunction with the fitting *h* for the 105 passage leading from the angle tube to the eye-pieces of the mask and such valve is adapted to be actuated by a lever *i* arranged in the mouth piece within the mask or adapted to project into the space within the mask so that such lever may be 110 actuated by the teeth of the wearer or otherwise with the object of lifting or otherwise moving the valve against its weight or against its controlling spring and maintaining it in such position 115 wherein the passage *h* to the eye-pieces is completely closed and communication established between the canister or other source of inspired air and the lungs of the wearer. 120

When a non-return valve, such as above described, is employed for controlling the flow of air into or out of the system I may combine therewith a diaphragm *d*<sup>1</sup> protected by the apertured plate *k* and suitably apertured and adapted to seat against 125 the spider *d*<sup>2</sup> the centre part of which normally closes the opening in the diaphragm. The pressure causing opening and closing of the diaphragm valve is 130

therefore not limited to the product of the intensity of the pressure in the cavity multiplied by the area of the valve opening but may be made several times greater (depending upon the relation between the area of the diaphragm and the area of the aperture therein) thus giving a tight closure of the valve for relatively small pressure differences.

10 In any modification of the invention I may provide one or more channels or the like adjacent to any part at which leakage is likely to occur and through which channels the expired air (or through  
15 which non-toxic air) may be passed, so that the joints in question will thereby be safeguarded against leakage of any deleterious gases, it being obvious that the channels or openings may be modified  
20 as to their number and arrangement and the means for circulating air there-through or thereover as may be found to give the best results in practice, having regard to the character of the device to  
25 which the invention is to be applied and the conditions under which the same is to be employed.

In Figure 9 there is shown a form of mask in which the edge of the mask is  
30 formed with a channel *l* into which the whole or a part of the expired air passes, the result being that any leakage into the interior of the mask is unimportant, since, unless grossly large, such leakage would  
35 merely mean the displacement into the mask of expired (i.e. non-toxic) air.

Figure 10 shows a modified arrangement in which the edge of the mask is formed  
40 with a plurality of expansion cavities *m* designed to minimise leakage, since any gas tending to enter the mask round the edge would expand into such cavities and thereby the velocity of entry reduced to a minimum.

45 It will be understood that the invention is not to be limited to the herein described details of construction and arrangement which are given by way of example only and further I may embody

any one or more of such details in the one mask or face-piece depending upon any particular practical requirements that may have to be fulfilled.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A face-piece for respirators and the like having an angle tube comprising a part projecting substantially at right angles to the mask for the passage of expired air and containing the expiratory valve and a lateral branch for the passage of the purified air, said lateral branch communicating with a passage concentric with the expiratory passage.

2. A face-piece for a respirator or the like as claimed in Claim 1, comprising a sound-collecting mouth piece or trumpet disposed within the mask, whereby the air expelled from the lungs in the act of speech passes direct through the expiratory valve to the outer air, substantially as and for the purpose hereinbefore set forth.

3. In a mask or the like having means whereby the inspired air may be caused to pass over the eye-pieces for the purpose of preventing condensation of moisture thereon, the provision of means whereby the inspired air may be taken direct to the lungs of the wearer, substantially as and for the purpose hereinbefore set forth.

4. The application to masks or breathing devices of expansion cavities or channels for sealing any cavity containing the eyes, nose, mouth, &c. (into which it is desirable that no leakage should occur) by surrounding the leakage path with non-toxic or expired air, substantially as described.

5. Improved respirators, gas-masks and the like, substantially as described with reference to the accompanying drawings.

Dated this 3rd day of April, 1922.

MARKS & CLERK.

*[This Drawing is a reproduction of the Original on a reduced scale.]*

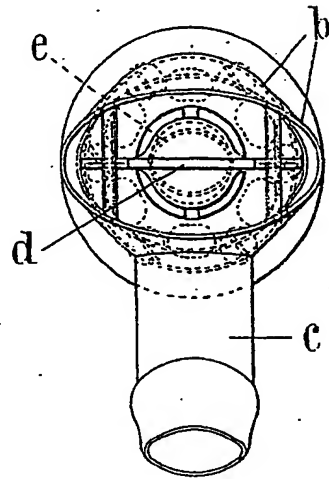


Fig. 1.

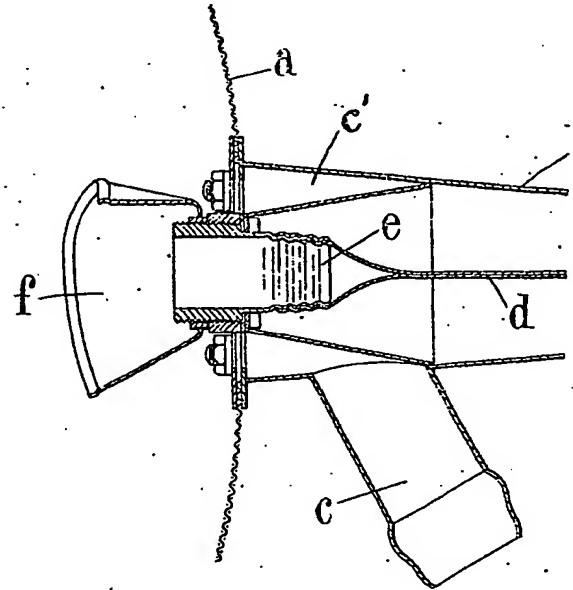


Fig. 2.

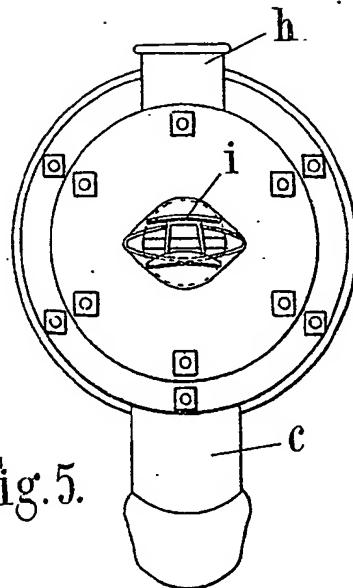


Fig. 5.

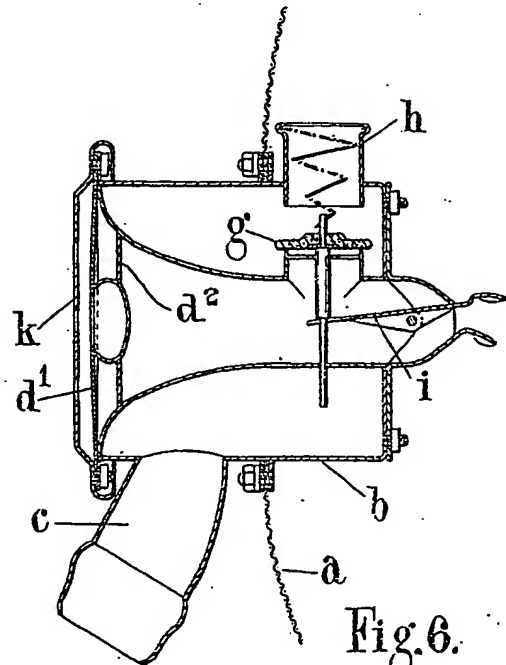


Fig. 6.

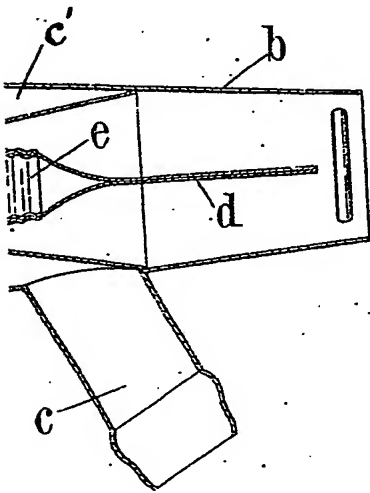


Fig. 4.

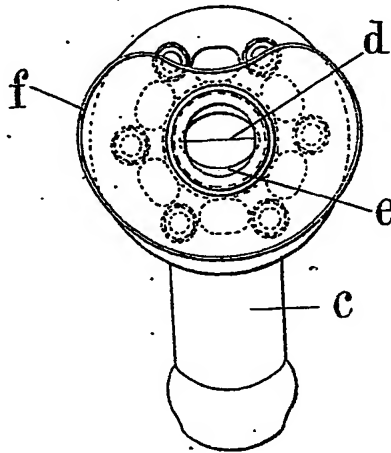


Fig. 3.

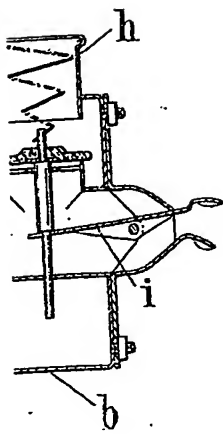
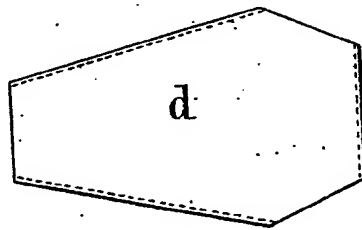


Fig. 6.

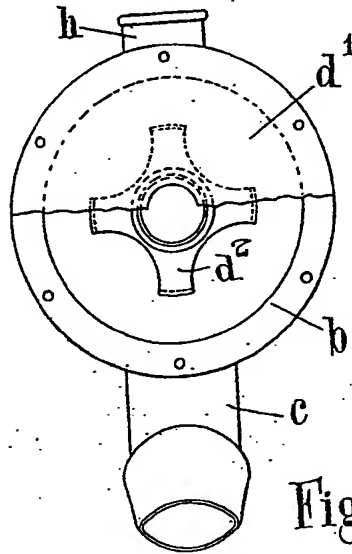


Fig. 7.

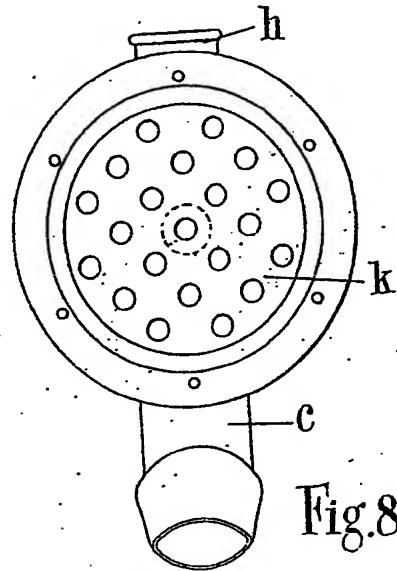


Fig. 8.

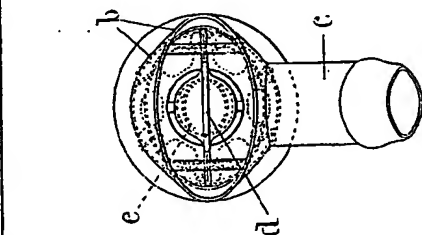


Fig. 1.

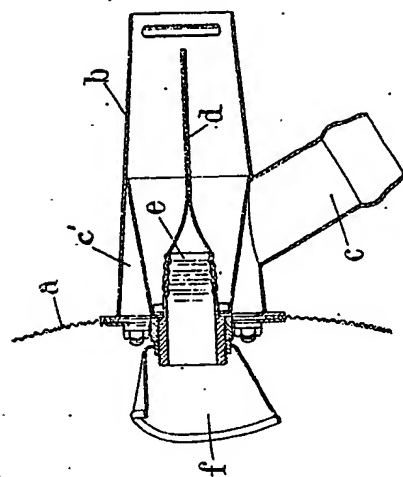


Fig. 2.

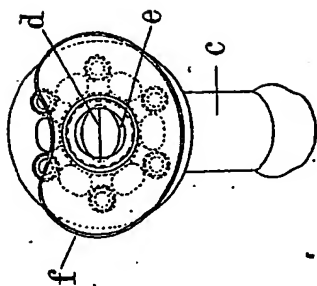


Fig. 3.

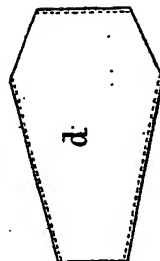


Fig. 4.

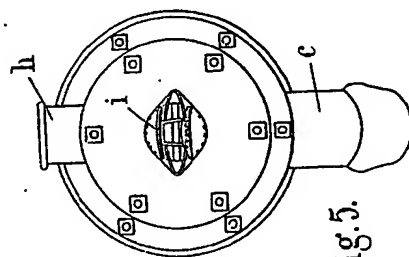


Fig. 5.

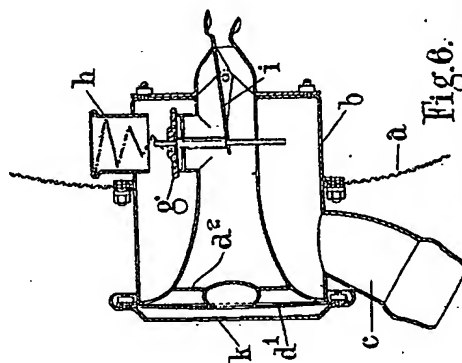


Fig. 6.

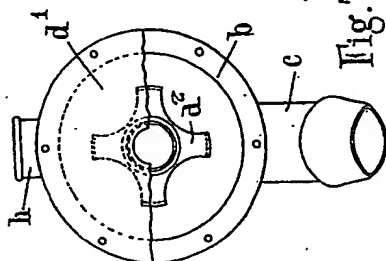


Fig. 7.

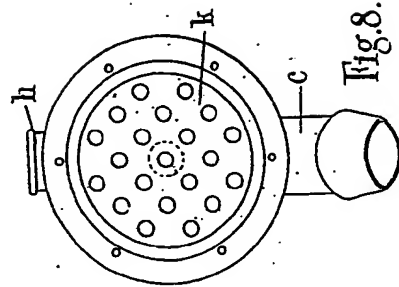


Fig. 8.

[This Drawing is a reproduction of the Original on a reduced scale]

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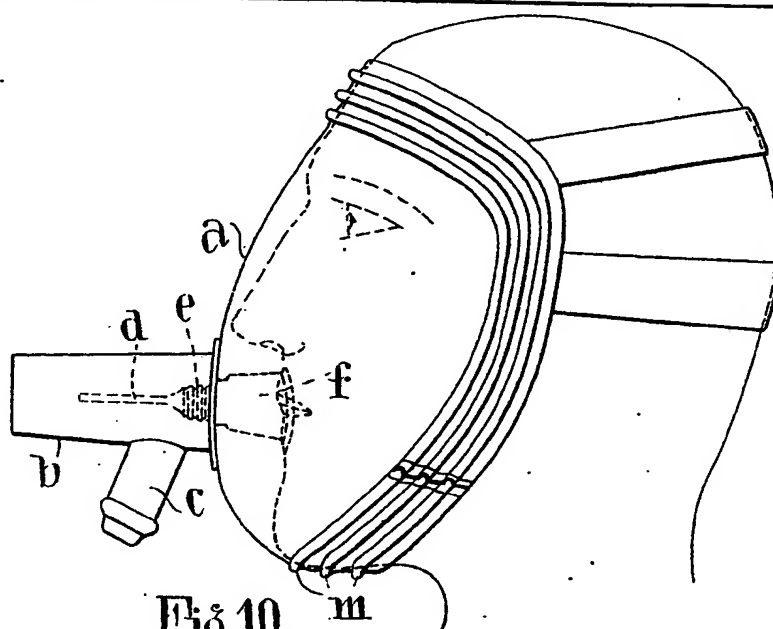


Fig. 10.

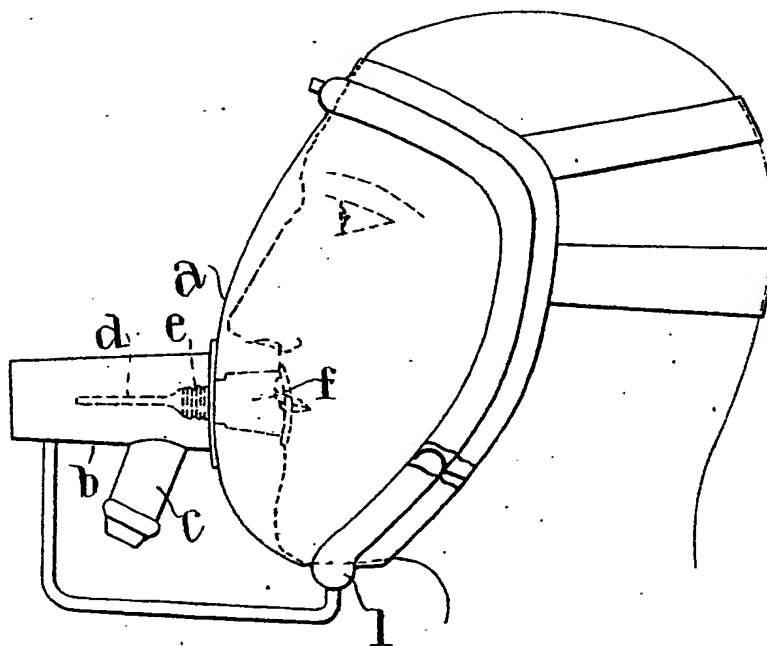


Fig. 9.